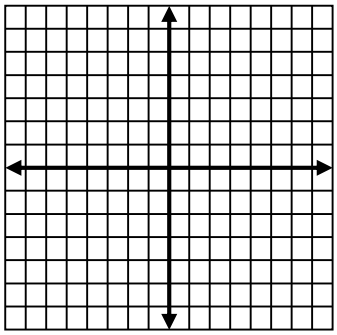
Precalculus Honors Summer Pre-course Packet June 2017 Name: _____

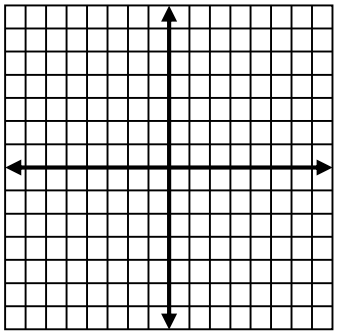
The following packet is designed to keep you fresh on the skills that will be necessary for a successful transition to Pre-calculus Honors in the fall. If you come across problems that you have difficulty solving, please take the time to call a friend, check out a YouTube or Khan Academy video, or email your teacher. Show all work that is required for you to achieve the desired goal (simplify, solve, graph, etc), including the process you may have used on the calculator. Please do not leave questions blank. Make every effort to respond to each problem. Upon your return to school in August, your teacher will spend time reviewing this packet. This review will be followed by an assessment on the skills included in this packet.

Graph the following functions (only use a graphing calculator when ready to check your graphs).

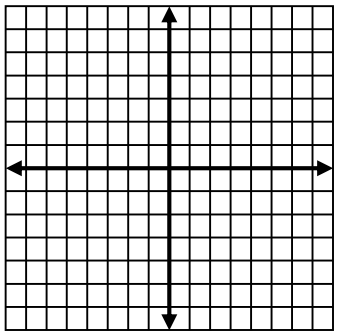
1. $f(x)=\dfrac{2x-9}{3}$



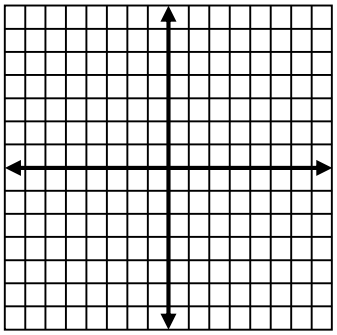
2. $f(x)=-3|x+1|+4$



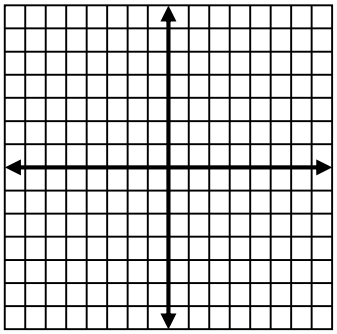
3. $y=(x-4)^2+1$



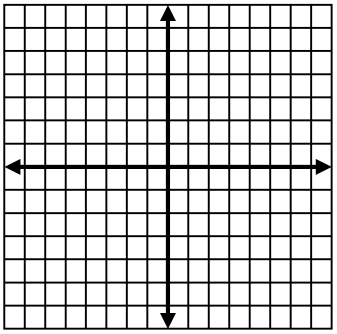
4. $f(x)=\begin{cases}\frac{3}{2}x-5 \; if \; x\le 2\\ -2x \quad if \; x>2\end{cases}$



5. $y=-2(x-3)(x+2)$



6. $y<x^2-7x+10$



Solve. Show all work. Circle your final answer (radical answers must be in simplest radical form).

7. $8x^3 - x^2 = 0$

8. $x^2 + 6x + 10 = 0$

9. $r + \dfrac{r^2 - 5}{r^2 - 1} = \dfrac{r^2 + r + 2}{r + 1}$

10. $-(x-1)^3 = 125$

11. $\sqrt{2x+3} = 2 - \sqrt{x}$

12. $x^3 + 8x^2 + 16x = 0$

13. $x^{-\frac{1}{3}} = 343$

14. $2(3)^x - 6 = 12$	15. $x^3 + 27 = 0$
16. $\frac{2}{3} = \frac{y}{y+1}$	17. $\frac{10(x-3)}{2x+1} = 5$
18. $5^x = 25^{2x-5}$	19. $2\log_4 x = 128$
20. $\ln x - \ln(2x-3) = 2$	21. $\ln x - \ln(2x-3) = 2$

22. $\lvert 3x-8\rvert > 6$	23. $x^{-\frac{2}{3}} = 216$

Simplify the following expressions. Circle your final answer (radical answers must be in simplest radical form).

24. $\frac{9}{\sqrt{3}} + \sqrt{108}$	25. $(16x^4y^{12})^{\frac{3}{4}}$
26. $\frac{2\sqrt{3}}{6\sqrt{8}}$	27. $\left(\frac{1}{4x^4}\right)^{\frac{-3}{2}}$
28. $\sqrt[3]{16x^6y^8}$	29. $(2+3i)(7-2i)$
30. $(i^3)(2+5i)$	31. $\frac{12}{6+i}$

32. $16^{\frac{3}{4}} \cdot 16^{\frac{1}{4}}$

33. $\left(\sqrt{-49}\right)\left(\sqrt{-81}\right)$

34. $\dfrac{x^2-4x-5}{x+1} \div \dfrac{x^2+10x+25}{x}$

35. $\dfrac{3}{x^2-4x} - \dfrac{x}{x-4}$

36. $\dfrac{\sqrt{x} - \dfrac{1}{2\sqrt{x}}}{\sqrt{x}}$

37. $\log 200 - \log 20$

38. $\ln e^{3x}$

39. $\log_2 4 + \log_2 16$

40. $\log_b b^{7x-2}$

41. Write $\log_a(3x+2) - \dfrac{1}{3}\log_a(2x+1) - 7\log_a(x^4+x+1)$ as a logarithm of a single expression.

Polynomials

42. Given the graph of $f(x)$,

a. Describe the end behavior

Left:_____Right: _____

b. Would the leading coefficient of the polynomial's equation be positive or negative? How do you know?

c. Determine whether it represents an odd-degree or an even-degree function. Explain.

d. State the number of real zeros. How do you determine this?

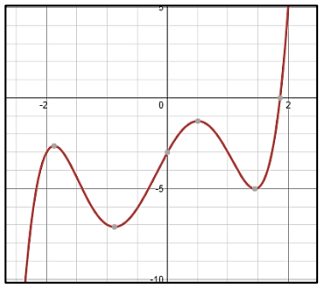
43. Write the letter of the equation that matches each graph in the box above its graph (be able to do without a graphing calculator)

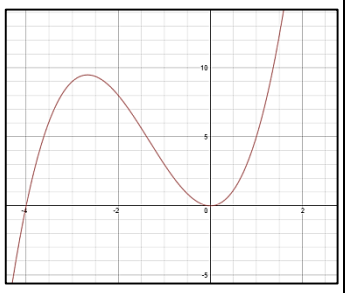
A. $f(x) = x^3 + 4x^2$

B. $f(x) = x^4 + 3x^3 + x + 3$

C. $f(x) = -2x^3 + 3x^2 + x + 3$

D. $f(x) = x^5 + x^4 - 5x^3 - 3x^2 + 6x - 3$





44. Given one (or two) real zeros, use synthetic division to find the remaining zeros for the following polynomials. Then use this information to write the functions in factored form.

a. $f(x) = x^3 - 7x^2 + 7x + 15,\ x = 5$

b. $f(x) = x^4 + 4x^3 - 3x^2 - 14x - 8,\ x = -1, x = 2$

45. Find the requested values using the following functions:

$f(x) = 2x + 3$

$g(x) = x^2 + 3$

$h(x) = \begin{cases} -3x \quad if \ x \le 0 \\ x + 1 \ if \ x > 0 \end{cases}$

a) $h(4)$

b) $h(g(1))$

c) $f(h(0))$

d) $f(g(x))$

46. A study compared the number y (in thousands) of auto mechanics in the U.S. for the years 1995 through 2000. The results are in this table.

Year	1995	1996	1997	1998	1999	2000
Number of auto mechanics, y	750	737	748	763	784	820

a) Find the quadratic regression equation for the given data.

b) Use your equation to predict the number of auto mechanics in 2015.

47. A golf ball is hit into the air with an initial upward velocity of 20 m/sec. A function that models the height, h(t) in meters, of the ball with respect to time, in seconds, is

$$h(t) = -4.9t^2 + 10t + 1.$$

a) What is the maximum height the ball reaches?

b) After how many seconds does it hit the ground?

48. Factor the following expressions completely (if not factorable, write "prime"):

a. $5x^3+40$	b. $3x^2-5x$	c. $8x^5-6x^2+12x^3-9$
d. $-5x^2-13x+6$	e. $9x^2+30x+16$	f. x^2+4
g. $x^2-4x-21$	h. $81x^3+24$	i. x^4-16

49. Simplify, if possible:

a. $\dfrac{6x+2y}{3x+y}$	b. $\dfrac{3x+2y}{3x}$	c. $\dfrac{\frac{a}{b}-a}{a+\left(\frac{a}{b}\right)^2}$
d. $\dfrac{2x(x+1)^2-3(x+1)^3}{8x^3+30x^2+18x}$	e. $\dfrac{x(x+2)(2x-9)}{x^3-4x}$	f. $\dfrac{3x(x-1)-2x^2}{2x^2-5x-3}$

50. Solve:

a. $(2x+1)(x-1)^2+(x+5)(2x+1)^2=0$

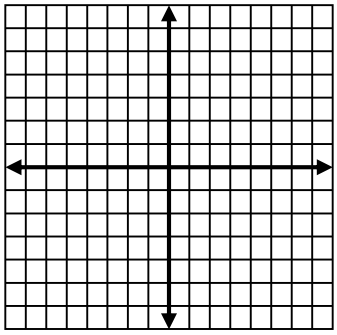
b. $\frac{x}{x+1}-\frac{1}{x+3}=\frac{1}{5x-1}$

c. Solve for y_1:

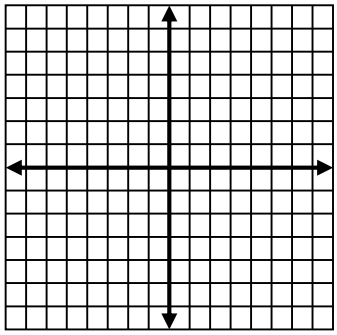
$xy_1+xy_1y^2-3=5y_1+xy$

51. Parent Graphs: Sketch the following graphs **without** the aid of a calculator or computer.

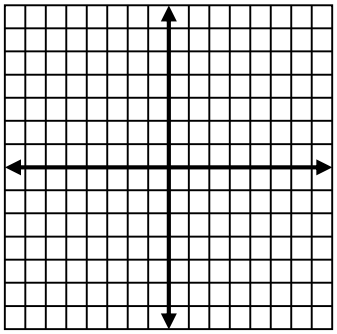
a. $y=x^2$



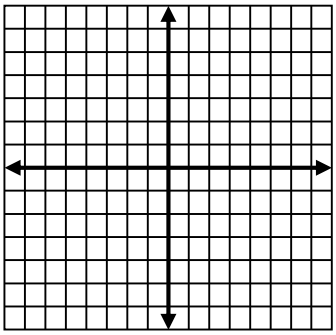
b. $y=x^3$



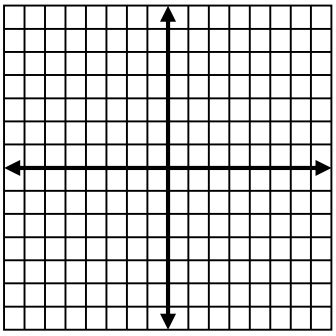
c. $y=|x|$



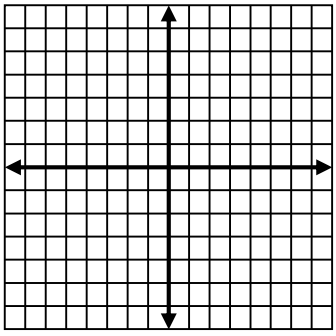
d. $f(x)=\sqrt{x}$



e. $f(x)=\log_{10}x$



f. $y=3^x$



52. Looking back at the parent graphs above, briefly describe how the graphs would be affected as a result of the following changes in parameter values?

a. $f(x)=\sqrt{x-2}+3$

b. $f(x)=2|x+1|-4$

c. $f(x)=3^{x+4}$

d. $f(x)=-5x^2+1$

53. Working with functions.

a. Given: $f(x)=\dfrac{2x+3}{x^2-2x+1}$

Find:

i. $f(12)$

ii. $f(6x)$

iii. $f(-3a+8)$

b. State the domain of the function using interval notation.

i. $f(x)=\dfrac{5x-2}{x^2-7x+12}$

ii. $f(x)=\sqrt{x^2-4}$

iii. $f(x)=\dfrac{8x}{\sqrt{2x+6}}$

c. Given the piece-wise function, find $f(-5)$, $f(0)$, and $f(12)$.

$$f(x)=\begin{cases}2x^2+6x+4, x<4\\ 6-x^2, -4\le x<12\\ 14, x\ge 12\end{cases}$$